POWERCORP
INTELLIGENT POWER SYSTEMS

# Presentation

# Powercorp Group

Powercorp Operations Pty Ltd

Powercorp R&D Pty Ltd

Powercorp Alaska LLC

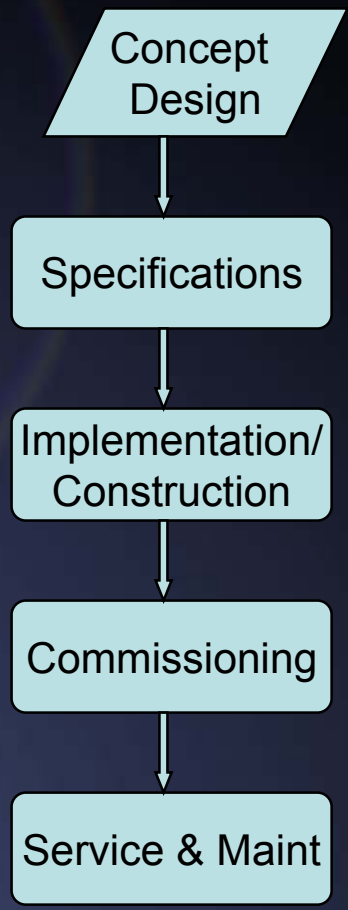
Dennis Meiners

# Agenda

1. About Us
2. Products and Services
3. Projects

# Key Capabilities

- **Power Station Control** (100kW-30 MW)
- **Renewable Diesel Integration**
- **Power Electronics Solutions**
- **Wind Farm**



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# Associates

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# Where is Powercorp?


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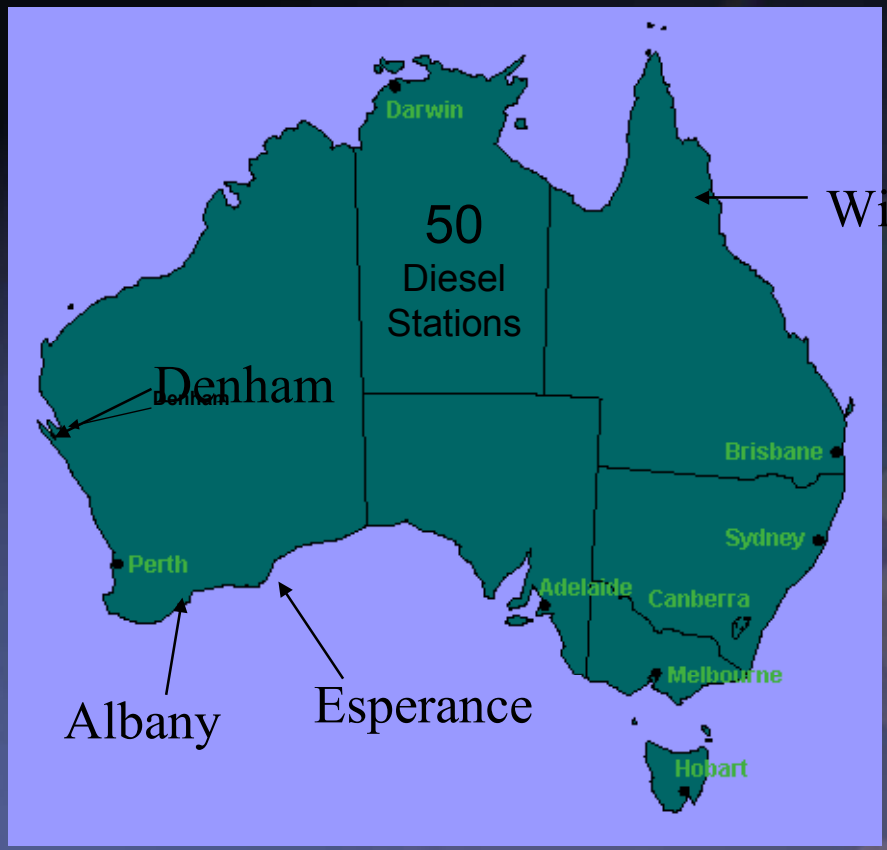
# Projects




Windy Hill

Malaysia


Mawson

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# The Team


**Engineering Staff – 30**

**Administration Staff – 7**

**Marketing & Sales Staff – 6**

# Training and Testing Facilities

Power Systems

Test Site

Power Electronics
Engineering Facility

Control Systems
Engineering Facility

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# In Common?

| | | |
|---|---|---|
| Northern Territory | **Remote Areas** | Alaska |
| Darwin | **Sister Cities** | Anchorage |
| Tropical/Desert | **Extreme Climates** | Arctic |
| Crocodiles | **Friendly Wildlife** | Bears |

# Wind-Diesel different from grid connected wind applications

- Communities
  - Smaller, more remote
  - Have limited infrastructure and equipment
  - Limited technical personnel
- Wind Turbines
  - Smaller
  - Less developed technically
  - More expensive to install and operate
- Wind-Diesel Integration Not Yet Mature
  - Utility integration issues not fully resolved
  - More project experience needed to optimize technology and economics

- Markets are Fragmented
- Installations are smaller and more remote
- Infrastructure is growing
- Access to equipment is less limited
- Wind turbines
- Success based on diesel controls
- Solve problems of remote powerstation

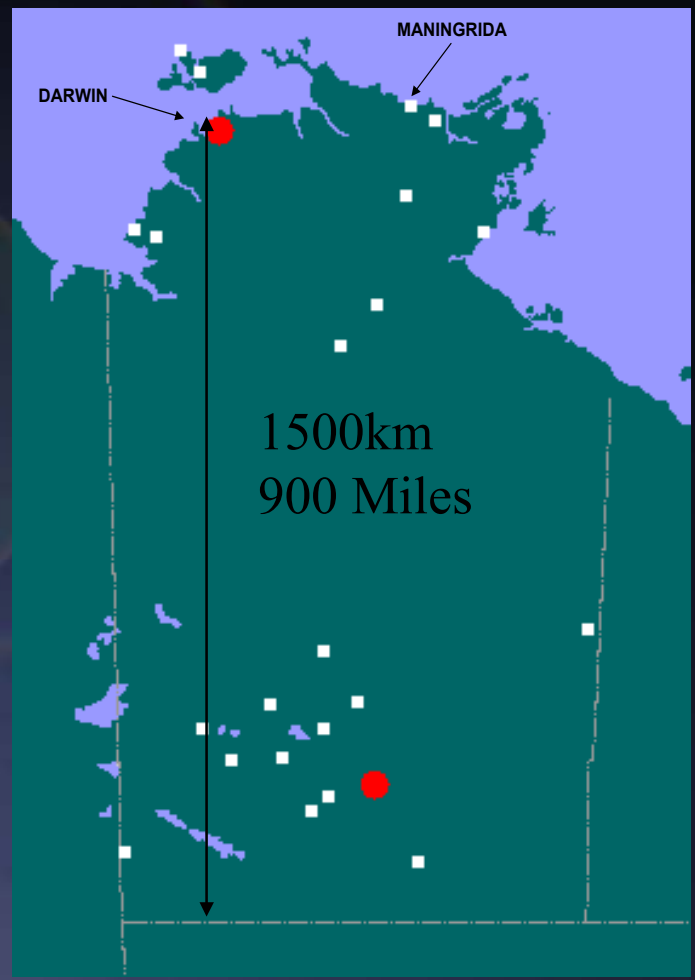
- Push toward high penetration

# Operating Experience of 15 Years

## 50+ IPS Multiple Diesel Systems

# Maningrida – SNAPSHOT

- **2 hours flight by light aircraft from Darwin.**
- **Cut off in the wet season.**
- **Maximum demand 1MW.**
- **Population 800 people.**
- **Semiskilled operators.**

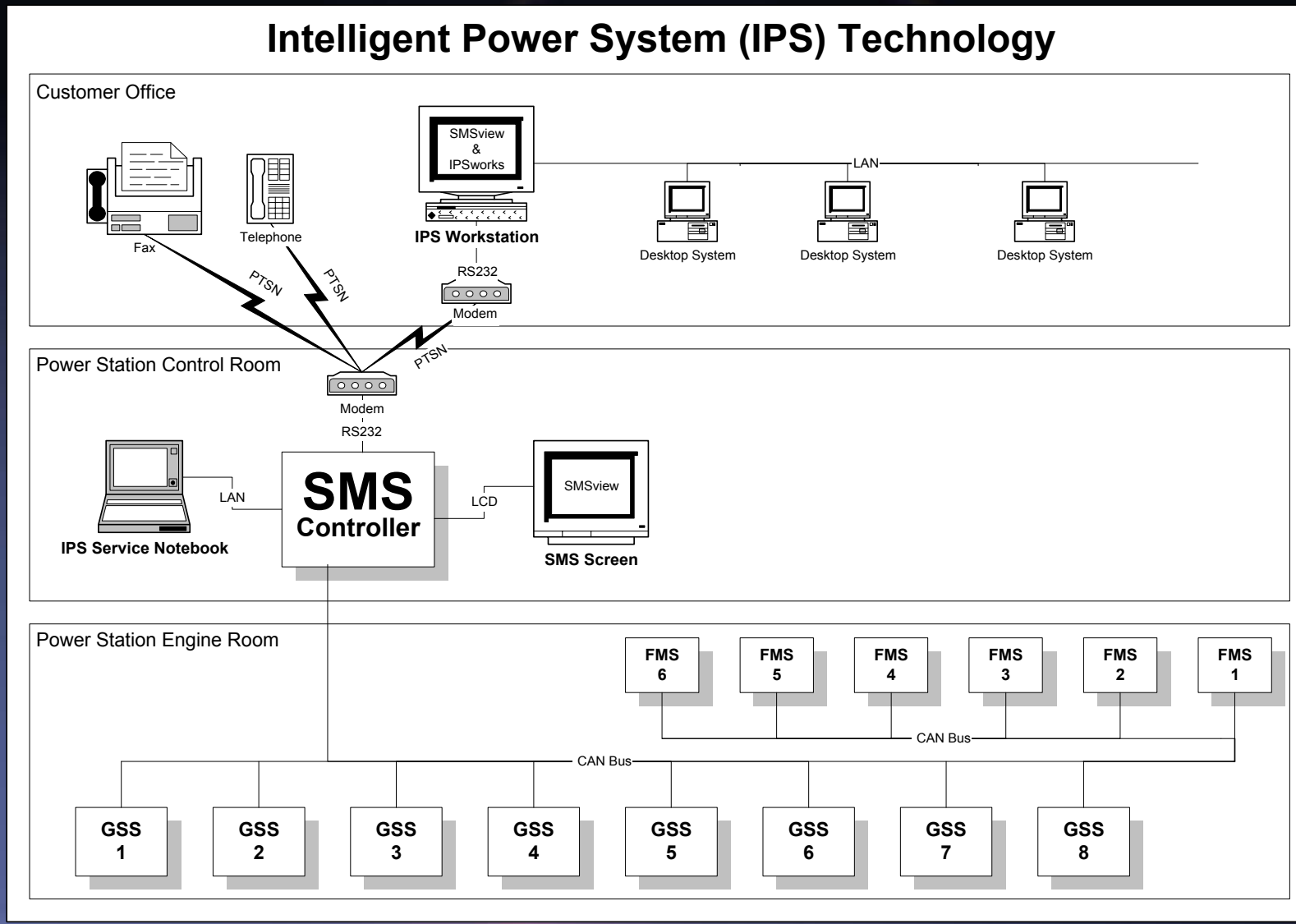



WHO'S BOB TONIGHT?
28. 5. 2002

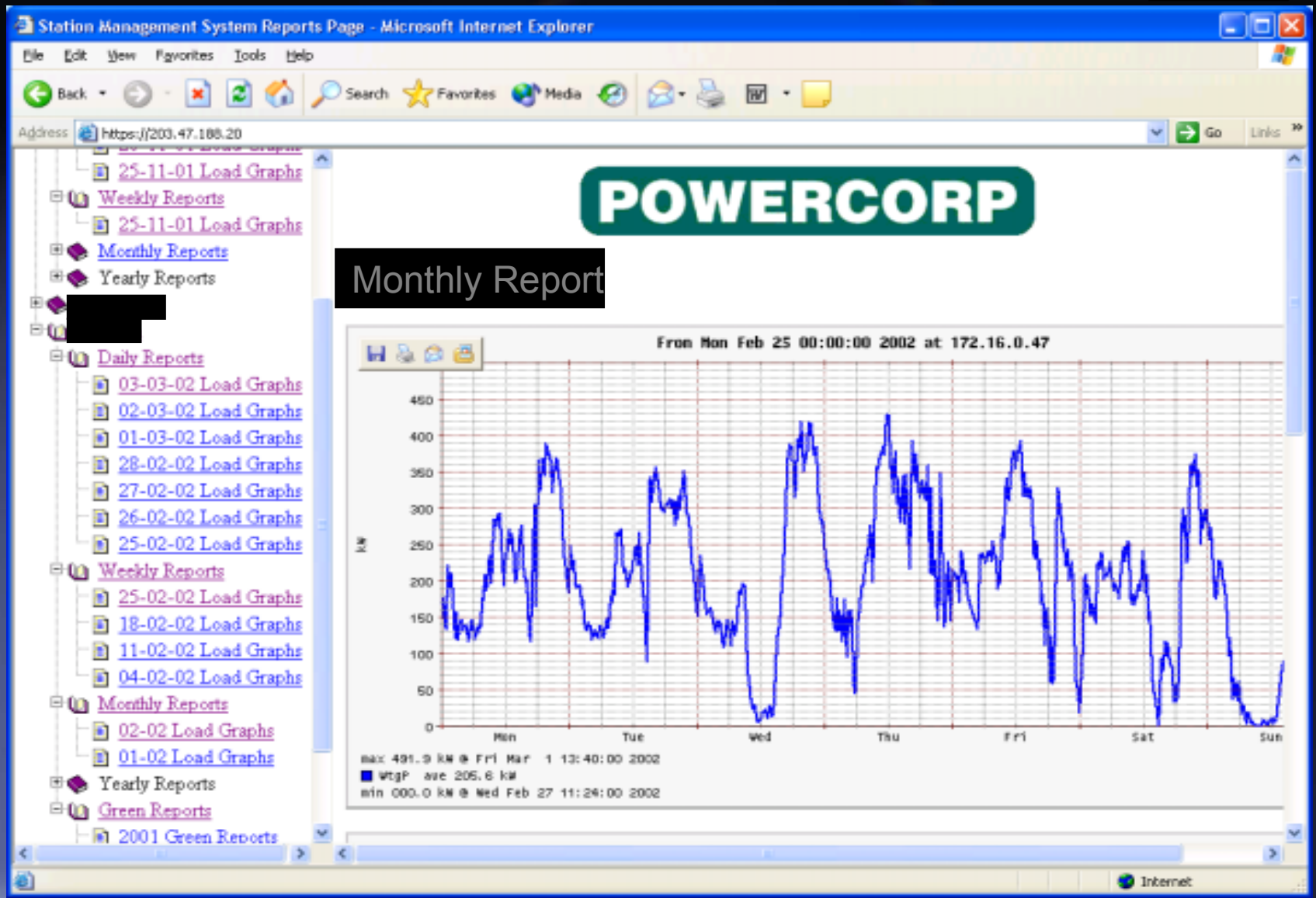
# Maningrida – PROBLEMS

- No historical data logging.
- Manual synchronization leading to alternator damage.
- Lack of scheduled servicing.
- Poor load-sharing and VAr sharing.
- Poor load factor – 60%.
- Poor fuel efficiency – <10 kWhr/gal.

# Maningrida Solution



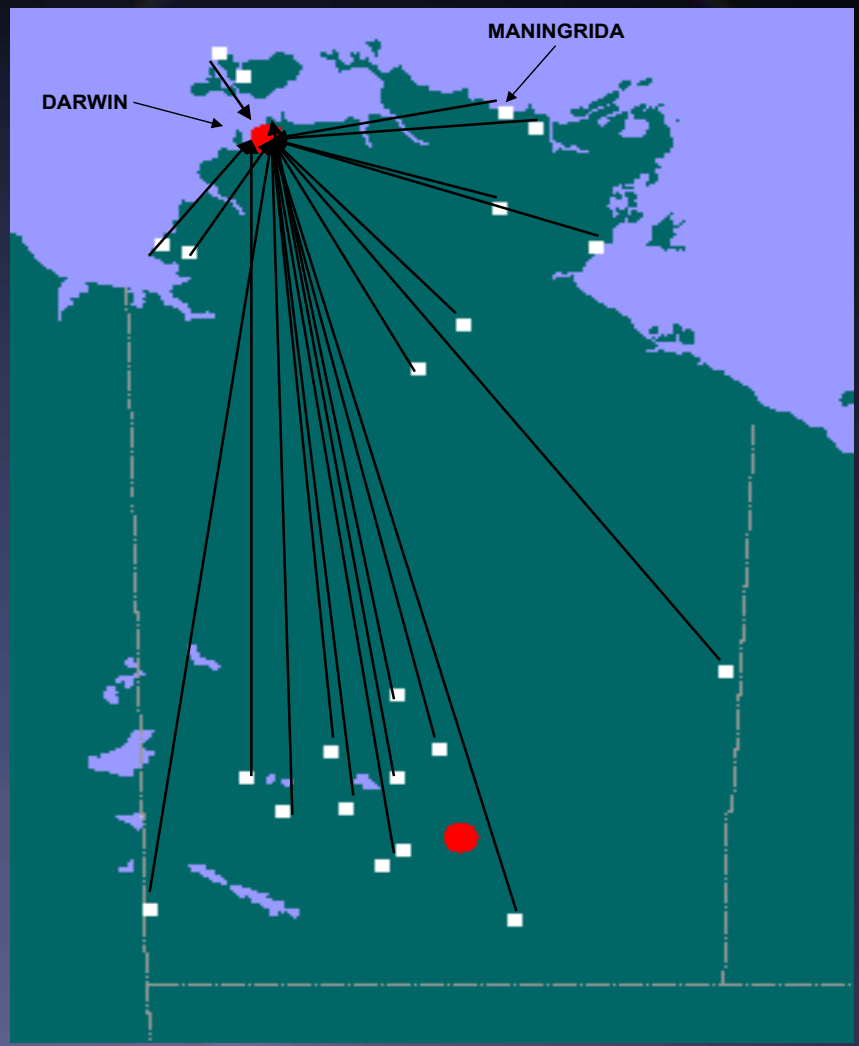
# Results: Web Reporting



# Results:

- Data logging 100 msec.
- Automatic Station Operation.
- Remote Access.
- Scheduling of gensets, with service warnings
- Improved load factor – 75% - 85%
- Improved fuel efficiency – > 12.5 kWhr/gallon

# Results: Service Integration



# Wind-Diesel System Elements


## Station Management:

Automation, Integration, Communication


## Wind Turbines

Power Output limit or Start/Stop

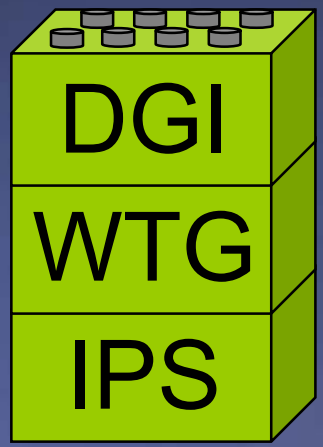

## Spinning Reserve

Dynamic Grid Interface to connect variable loads to power system

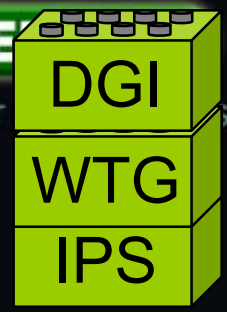

## Controllable Loads

Demand Managed Devices to maximise use of available wind

# Objectives




- Utility Quality
- Maintain Diesel Loadings
- Maximise Fuel Savings
- Station Heating from Wind



# Wind Diesel Projects

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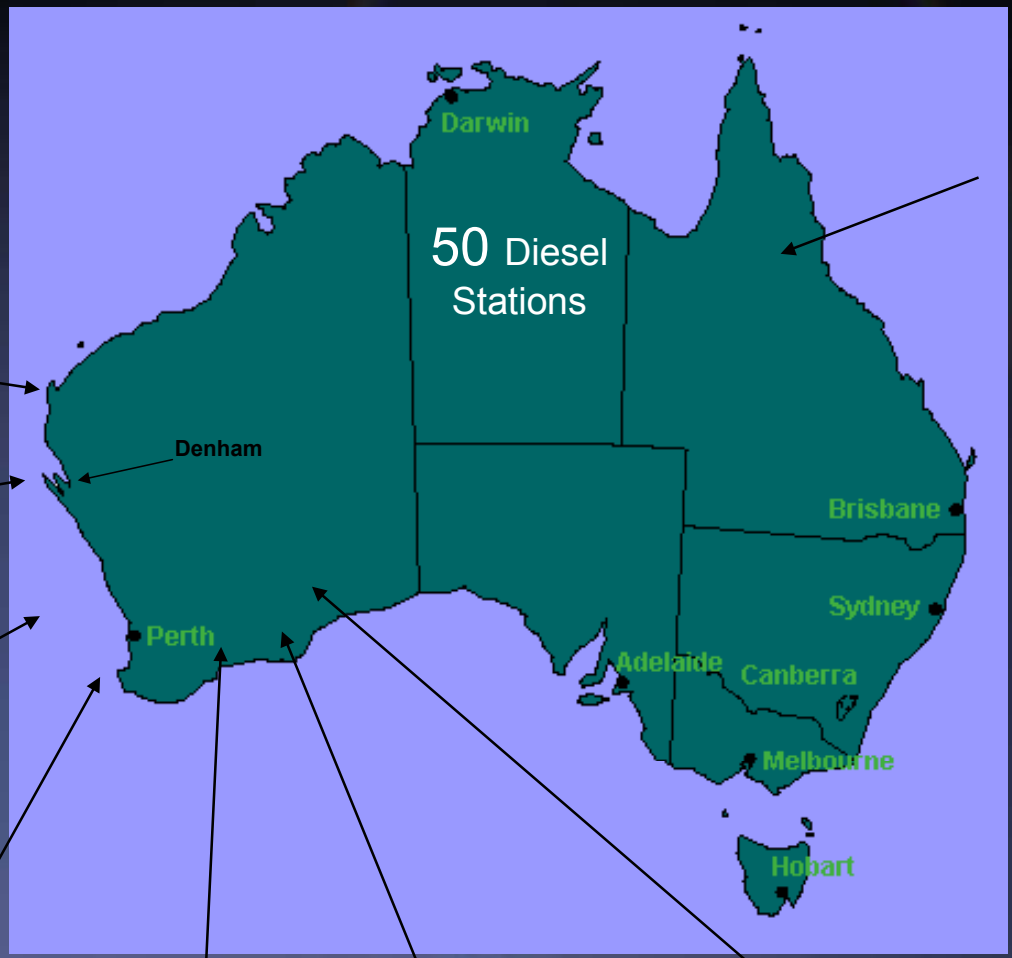


Cocus Island

Exmouth

Denham

Rottnest Island

Albany

Bremer Bay

Hopetoun

Esperance

Windy Hill

Mawson

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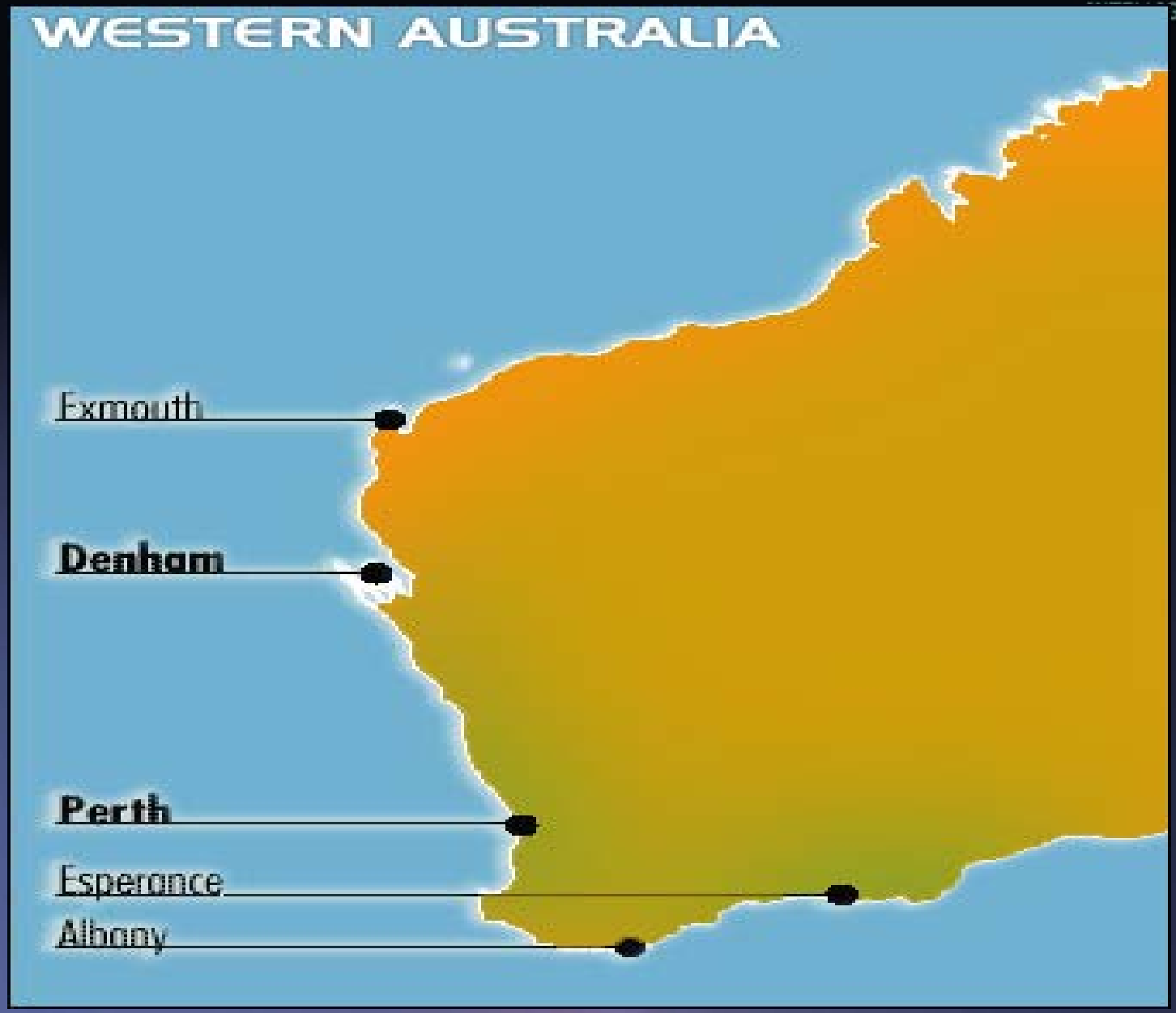

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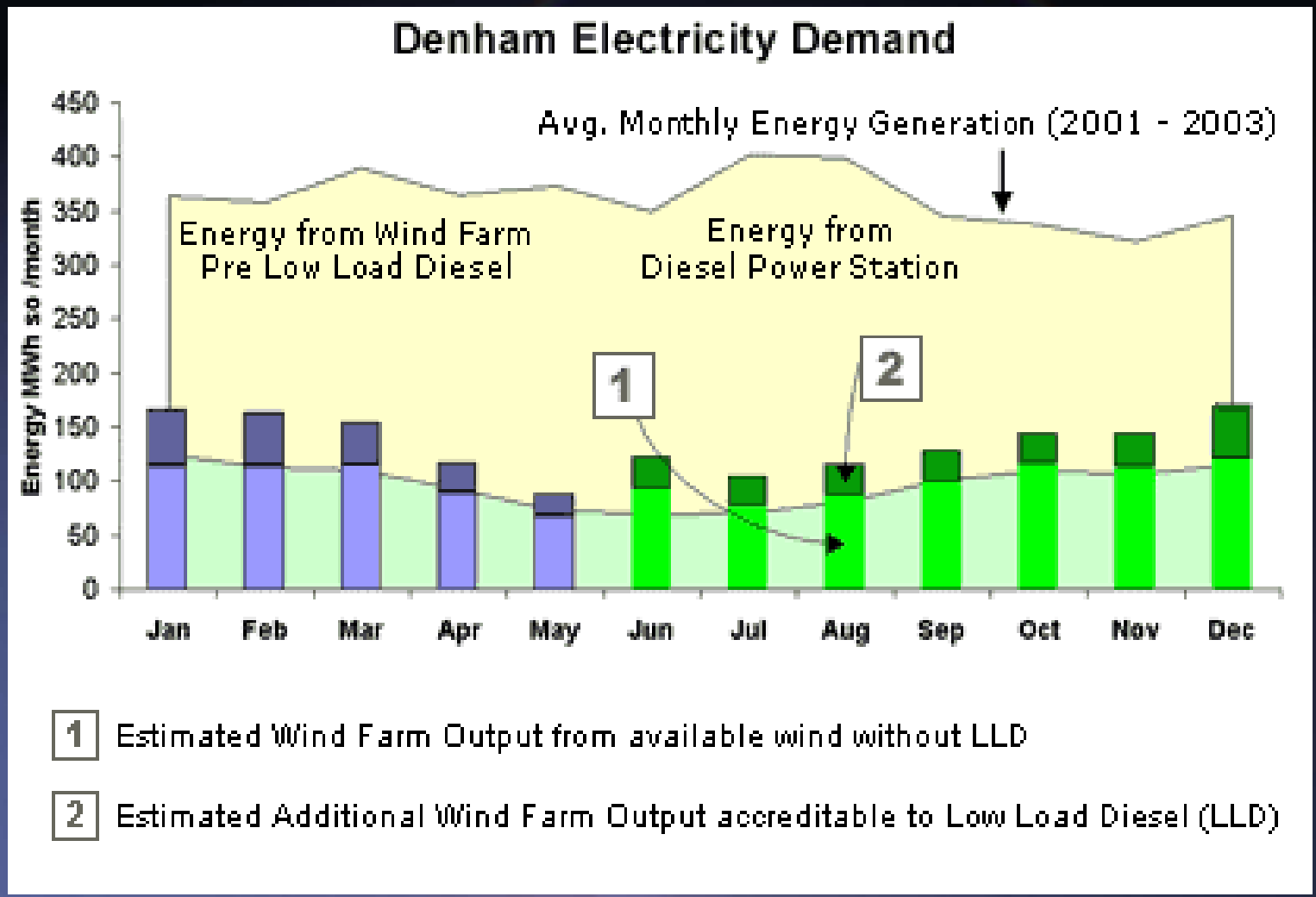
# Esperance

- Population: 12,500
- Diesel & Gas Turbines (30 MW)
- Two wind farms (9 V-27, 6 E-40)
- 22% Electricity by Wind

# Denham

- Pop: 800
- Ave load 400 kWe
- 3@ E-30
- 250 kW LLD
- 100 kW DGI
- 36% of electrical energy displaced

# Denham


Denham Electricity Demand
Avg. Monthly Energy Generation (2001 - 2003)
Energy from Wind Farm
Pre Low Load Diesel
Energy from
Diesel Power Station
Energy MWh so /month
450
400
350
300
250
200
150
100
50
0
1
2
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1 Estimated Wind Farm Output from available wind without LLD
2 Estimated Additional Wind Farm Output accreditable to Low Load Diesel (LLD)

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# Hopetoun

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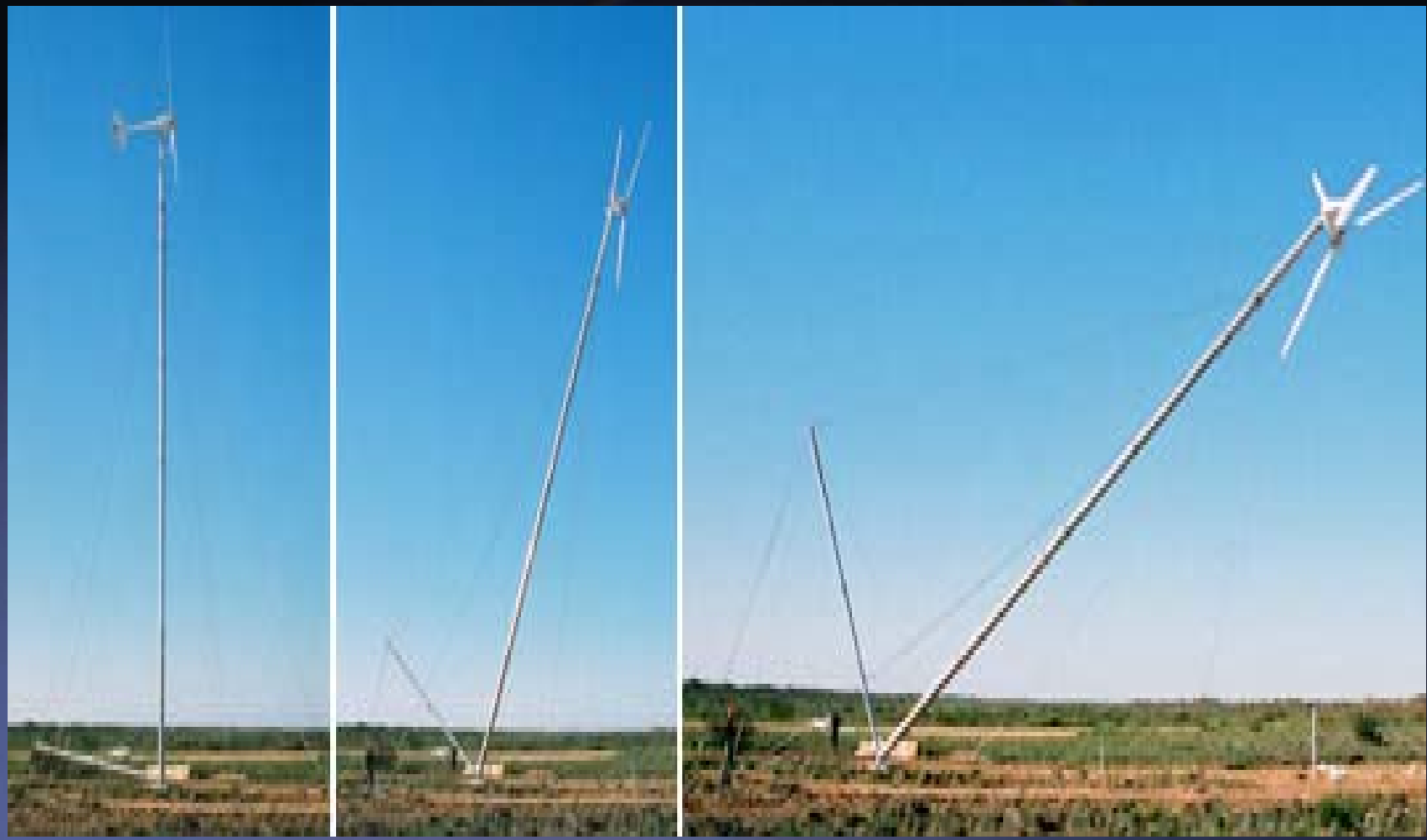
# Exmouth



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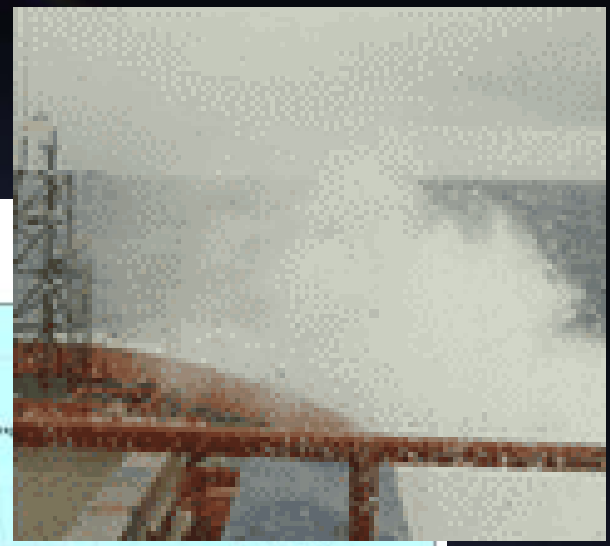
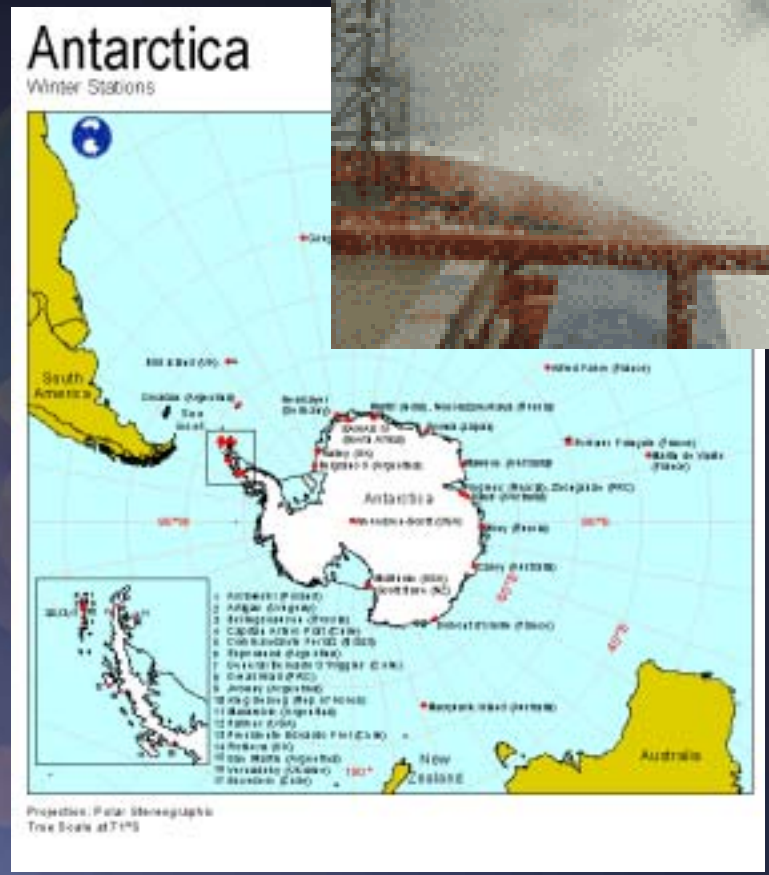
# Cocos, Rottnest, Bremer Bay

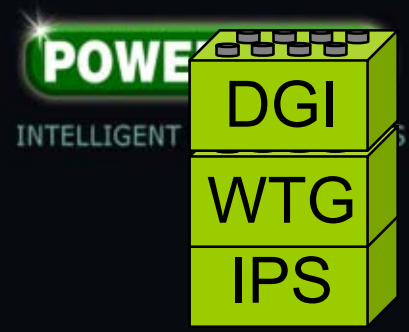
# Mawson Station

# IPS Wind/Diesel Mawson, Antarctica





# Mawson Power System




- Station Management System SMS
- Generator Supervisory Systems GSS (4)
- Feeder Management Systems FMS (4)
- Enercon E-30 Wind Turbines
- Electrical boilers with DGI for heating

# Mawson Main Power House


**4 Gensets: 125 kW el each**

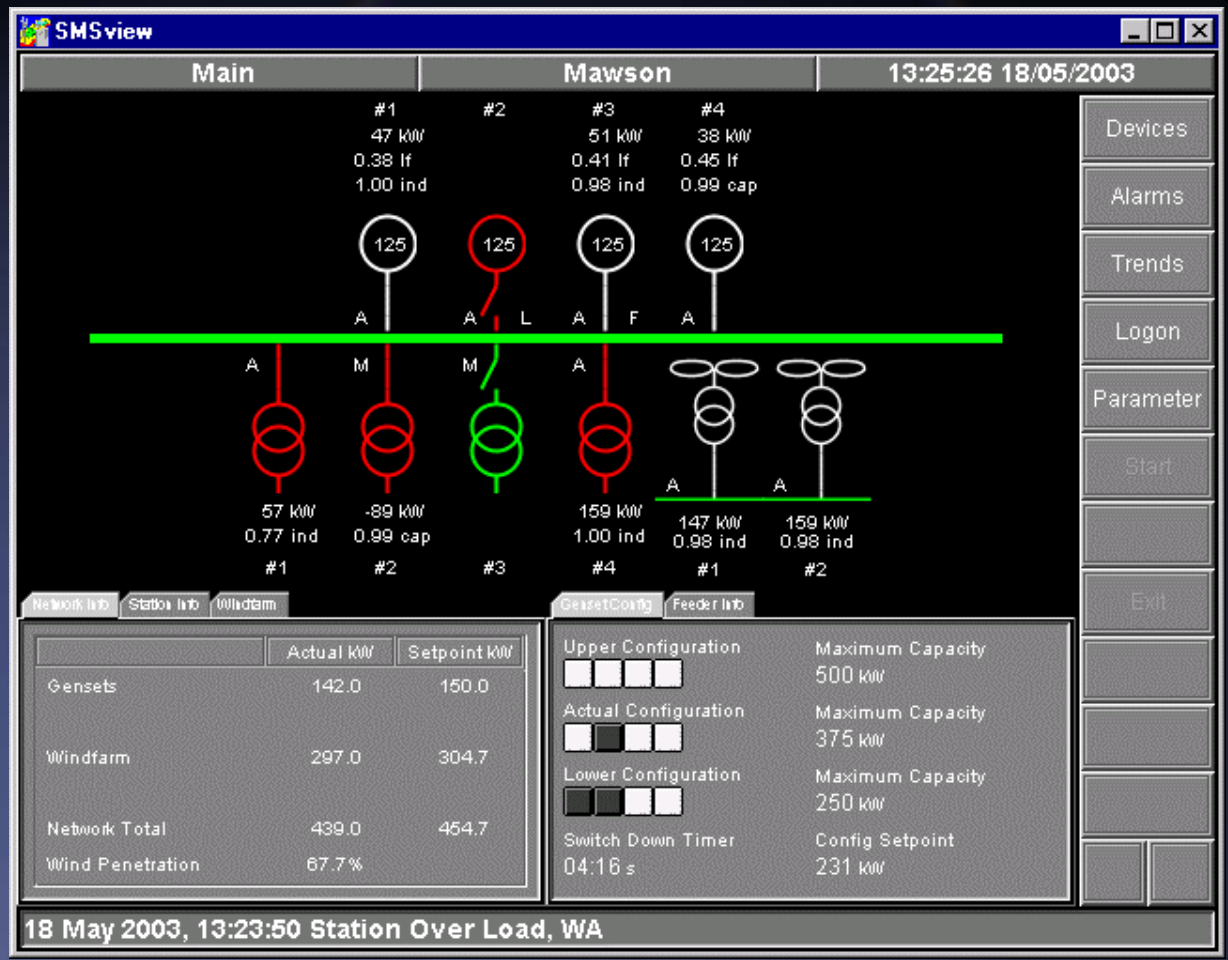
**El demand: 230 kW average**

**Th demand: 300 kW average**
**(trad: cogeneration + oil boilers)**

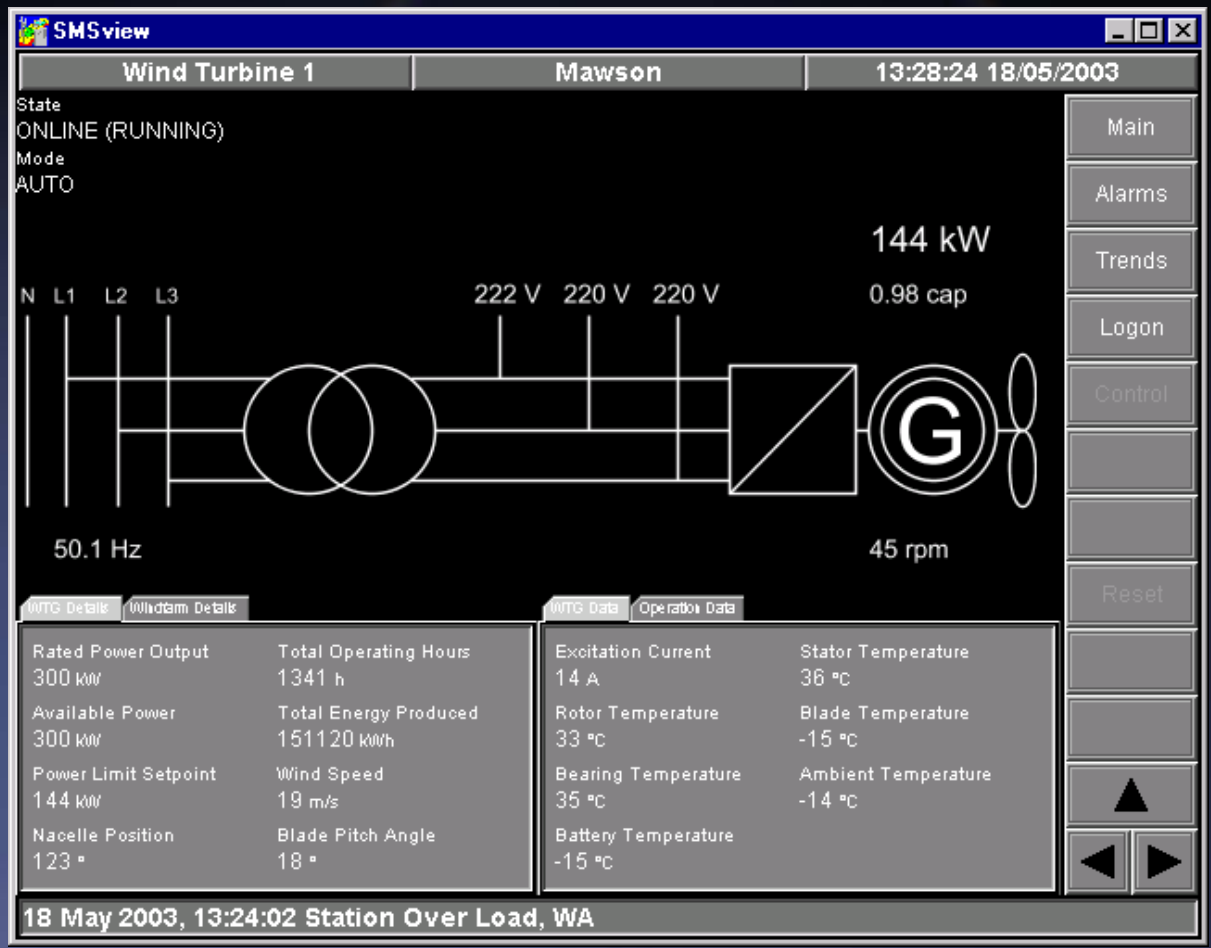
**Total fuel cons: 650,000 l/a**

# Mawson IPS Control Room

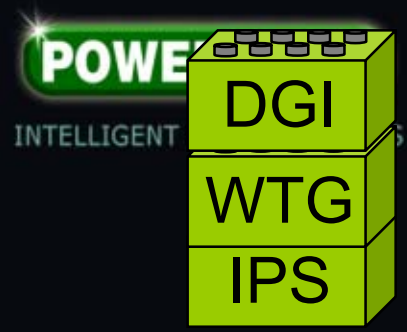
# Station Overview Page



# Wind Turbine Detail Page



# Mawson Outcomes




- High penetration wind diesel system: average 60% wind penetration
- IPS control system operates Wind diesel system in fully automatic mode
- Electric heaters/DGI controlled by IPS
- Fuel savings of approx. 140,000 gal/a
- Remote visualisation and trending

# Pathway to Wind/Diesel

Generation Control
- Control of gensets, feeders, and demand devices
- Gas Turbines
- Wind/Diesel Systems
- Diesel/Hydro
- Diesel/Battery/PV

Power Station Management
- Common Programming
- Standard Proven Controls
- Remote Monitoring
- Remote Access
- Access to Service Support Network through SCADA

Power Quality Solutions
- Dynamic Grid Interface™
- PowerStore™
- Low Load Diesel™